



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
WASHINGTON, D.C. 20460

June 27, 2011

OFFICE OF  
SOLID WASTE AND  
EMERGENCY RESPONSE

VIA E-MAIL AND FEDERAL EXPRESS

Mr. John Voyles, Jr.  
Vice President,  
Transmission and Generation Services  
EON US  
220 West Main Street  
PO Box 32020  
Louisville, Kentucky 40232

Dear Mr. Voyles,

On August 3, 2010 the United States Environmental Protection Agency ("EPA") and its engineering contractors conducted a coal combustion residual (CCR) site assessment at the Tyrone facility. The purpose of this visit was to assess the structural stability of the impoundments or other similar management units that contain "wet" handled CCRs. We thank you and your staff for your cooperation during the site visit. Subsequent to the site visit, EPA sent you a copy of the draft report evaluating the structural stability of the units at the Tyrone facility and requested that you submit comments on the factual accuracy of the draft report to EPA. Your comments were considered in the preparation of the final report.

The final report for the Tyrone facility is enclosed. This report includes a specific condition rating for each CCR management unit and recommendations and actions that our engineering contractors believe should be undertaken to ensure the stability of the CCR impoundment(s) located at the Tyrone facility. These recommendations are listed in Enclosure 2.

Since these recommendations relate to actions which could affect the structural stability of the CCR management units and, therefore, protection of human health and the environment, EPA believes their implementation should receive the highest priority. Therefore, we request that you inform us on how you intend to address each of the recommendations found in the final report. Your response should include specific plans and schedules for implementing each of the recommendations. If you will not implement a recommendation, please explain why. Please provide a response to this request by July 27, 2011. Please send your response to:

Mr. Stephen Hoffman  
U.S. Environmental Protection Agency (5304P)  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460

If you are using overnight or hand delivery mail, please use the following address:

Mr. Stephen Hoffman  
U.S. Environmental Protection Agency  
Two Potomac Yard  
2733 S. Crystal Drive  
5<sup>th</sup> Floor, N-5838  
Arlington, VA 22202-2733

You may also provide a response by e-mail to [hoffman.stephen@epa.gov](mailto:hoffman.stephen@epa.gov)

You may assert a business confidentiality claim covering all or part of the information requested, in the manner described by 40 C. F. R. Part 2, Subpart B. Information covered by such a claim will be disclosed by EPA only to the extent and only by means of the procedures set forth in 40 C.F.R. Part 2, Subpart B. If no such claim accompanies the information when EPA receives it, the information may be made available to the public by EPA without further notice to you. If you wish EPA to treat any of your response as "confidential" you must so advise EPA when you submit your response.

EPA will be closely monitoring your progress in implementing the recommendations from these reports and could decide to take additional action if the circumstances warrant.

You should be aware that EPA will be posting the report for this facility on the Agency website shortly.

Given that the site visit related solely to structural stability of the management units, this report and its conclusions in no way relate to compliance with RCRA, CWA, or any other environmental law and are not intended to convey any position related to statutory or regulatory compliance.

Please be advised that providing false, fictitious, or fraudulent statements of representation may subject you to criminal penalties under 18 U.S.C. § 1001.

If you have any questions concerning this matter, please contact Mr. Hoffman in the Office of Resource Conservation and Recovery at (703) 308-8413. Thank you for your continued efforts to ensure protection of human health and the environment.

Sincerely,  
/Suzanne Rudzinski/, Director  
Office of Resource Conservation and Recovery

Enclosures

Enclosure 2  
Tyrone Recommendations

## **4.2 Tyrone Ash Pond**

### **4.2.1 Hydrologic and Hydraulic Recommendations**

#### *September 2010 Draft Report*

The current ash pond configuration with lower crest heights and steepened slopes are not as designed. The recent topographic mapping of the site indicates crest elevations on the Tyrone Ash Pond range from 533.5 feet at south portion of west dike to 535.4 feet at the west portion of the south dike. The mapping shows crest elevations below 534 feet on the north and west dikes. Although FMSM performed a hydrologic study of existing conditions in their 1998 report, the results cannot be considered valid since they used a crest elevation of 536 feet and a water elevation of 534 feet. In order to confirm that the impoundment will not be overtopped during a design storm event, as well as determine whether acceptable freeboard conditions exist, the appropriate design storm rainfall (per MSHA guidelines), or ½ PMF, should be applied to the impoundment's entire tributary watershed to determine the resulting water surface elevation in the pond. Accurate impoundment volumes and embankment elevations must be utilized in any model that is used to determine the structure's storage and/or routing capabilities.

#### *Final Report*

In comments included in the January 26, 2011 response to the draft report by Kentucky Utilities and comments from Kentucky Department of Water to EPA dated January 31, 2011 both parties take exception to the use of MSHA guidelines to evaluate CCW impoundments. AMEC followed the guidelines presented in our scope of work for assessment of CCW impoundments which was provided by EPA.

Although the January 2011 hydrologic and hydraulic information supplied by KU addressed more current conditions, some inadequacies remain. MSHA guidelines for dams assigned a Significant Hazard classification, applied to the dam by AMEC in this assessment as a result of its proximity to the Kentucky River, suggest that structure should be capable of passing the ½ PMF precipitation event while maintaining a minimum freeboard of 3 feet. As noted in Section 3.2.1, construction to raise the crest elevation from the current degraded minimum of 533.1 feet to at least 534 feet, preferably 534.5 feet (NAVD88), in conjunction with application of a maximum operating water surface elevation of 529.5 feet, would increase available freeboard for lesser design storms. The rating of fair given to the Tyrone Ash Pond signifies the fact that, although no existing dam safety deficiencies are recognized for normal hydrologic loading conditions (100-year 24-hour rainfall event), rare or extreme hydrologic events (½ PMF) may result in a dam deficiency.

Additionally, although the 2011 Hydrologic and Hydraulic Assessment (Attachment 3 of KU's Draft Report comments) and design documents indicate the Tryone Ash Pond principal spillway discharge pipe diameter is 15-inches, plant personnel have confirmed the pipe is 18-inches in diameter. Hydraulics associated with the existing larger pipe would provide additional freeboard compared to values shown in the calculations/assessment. The correct pipe size should be used in all future hydrologic and hydraulic calculations that are performed for the structure.

### **4.2.2 Geotechnical and Stability Recommendations**

#### *September 2010 Draft Report*

In the opinion of the assessing professional engineer, the criteria for minimum safety factors should be in accordance with USACE EM 1110-2-1902 with a minimum seismic safety factor of 1.2 as recommended by 2007 *MSHA Coal Mine Impoundment Inspection and Plan Review Handbook*, page 88. Likewise, if the dam does not meet the above seismic factor of safety, then the stability of the embankment should be analyzed and the amount of embankment deformation or settlement that may occur should be evaluated to assure that sufficient section of the crest will remain intact to prevent a release from the impoundment.

The provided stability analysis by MACTEC dated August 27, 2010 analyzed two crosssections, one on the northwest corner and one on the north dike. The stability analyses were performed using the existing over-steepened slopes, existing loading conditions, and a seismic acceleration. The minimum safety factors are generally in line with the recommended criteria as stated above. The results generally indicate safety factors well above the minimum target values. However, in the opinion of the assessing professional engineer, the analyses should be

revised in accordance with the following recommendations. The analysis should consider all critical stages over the life of the pond including pond full conditions. These conditions would need to be determined in conjunction with the hydrologic and hydraulic recommendations above. The hydrologic and hydraulic analysis will provide a phreatic surface through the embankment. The almost vertical phreatic surfaces shown in the analysis are not typical. The friction angle value of 30 degrees used for the CCW (ash) in the analysis appears high for loose, saturated ash. More typical ash friction values are 28 degrees for compacted, 24 degrees for loosely compacted, and 11 degrees for uncompacted material. Consideration should be given for lowering strength values to account for exhibited lower strengths or inconsistencies within the fill or foundation materials. Lowering the friction value, by one or two degrees, or more for weaker soils would be conservative and more appropriate. More layering of the embankment materials is needed to model lower strength materials, such as the low strength material encountered in Boring 6T. In addition, it appears odd that the moisture content at a depth of about 5 feet in Boring 6T is 79.9 percent, this soil and the material below is described as wet, and yet no water was encountered in the boring. Consideration should also be given to allowing some time for water levels in the piezometers to develop and stabilize. Some of the analyses presented appear limited to a circular surface; different types of failure surfaces should be analyzed and optimized. We understand additional laboratory results and analyses of other sections are to be performed as part of this study. Considerations at other sections include elevated water levels and soft foundation soils encountered at Section 1 and steep natural slope conditions below the sections on the west dike. The study should be revised to address the recommendations in this report and reviewed when complete. The completed analyses should include data sheets to show all input parameters, discussion on how each parameter was derived and preferably an AutoCAD (or equivalent) section to facilitate review.

#### *Final Report*

In comments included in the January 26, 2011 response to the draft report by Kentucky Utilities and comments from Kentucky Department of Water to EPA dated January 31, 2011 both parties take exception to the use of MSHA guidelines to evaluate CCW impoundments. AMEC followed the guidelines presented in our scope of work for assessment of CCW impoundments which was provided by EPA.

In the assessing engineer's opinion, the calculated factors of safety presented in the most recent stability analyses are not conservative. The results show factors of safety for 1.3:1 and 1.6:1 downstream slopes at sections 1 and 6 to be greater than 2. In the assessing engineer's opinion, the downstream slope at section 6 is marginally stable. In addition, it is recommended that the downstream slopes adjacent to the west and northwest sides of the pond be analyzed. The "groundwater" seep in the area below section 3 and the new scarps occurring on the slopes below the impoundment indicate instability and warrant study, stability analyses, repair as needed, and diligent monitoring of the area to protect the stability of the above ash pond embankments.

#### **4.2.3 Monitoring and Instrumentation Recommendations**

##### *September 2010 Draft Report*

Three piezometers were installed as part of the stability analysis investigation in August 2010. It would be prudent for the Tyrone Generating Station to maintain and protect these instruments, and document monitoring frequently until base line phreatic readings are apparent. After that time, a regular monitoring frequency should be maintained and the results evaluated by an engineer. Monitoring should include pond and river levels and should include additional readings and evaluation in response to elevated pond levels or specific rainfall events. AMEC recommends that, at minimum, additional instrumentation be installed at the crest and toe of critical slopes. Installation should occur as budgets allow, or immediately upon development of future problems.

##### *Final Report*

As indicated in their comments to the Draft Report, "KU continues to periodically monitor instrumentation including piezometers and the principal spillway weir at the Tyrone Ash Pond." KU has stated the piezometers in B-3C will be replaced soon. As stated in the draft report, AMEC recommends the monitoring of the piezometers to include pond and river levels and

additional readings for significant rain events. Documentation for recent and/or significant rain events should be included in the monitoring data. The recent appearance of scarps on the hillside slopes below the ash pond, indicate KU should evaluate performing a geotechnical study including the installation of piezometers on these slopes.